**Table 1. Micronutrient application rates (lb element/acre)***

| Soil Class | Banded | | Broadcast | | | Foliar Spray | | |
|---|---|---|---|---|---|---|---|---|
| | Mn | Zn | Mn | Zn | Cu | Mn | Zn | Cu |
| Mineral (MIN) | 3 | 3 | 10 | 6 | 2 | 0.5 | 0.5 | 0.25 |
| Mineral-Organic (M-O) | 3 | 3 | 10 | 6 | 4 | 0.5 | 0.5 | 0.25 |
| Organic (ORG) | 3 | 3 | 10 | 6 | 6 | 0.5 | 0.5 | 0.25 |

* Once a micronutrient need has been established by soil testing, a choice of the material to use must be made. Under the soil and climatic conditions in North Carolina, sulfates of the particular element and liquids formulated with ammonia, chlorides and nitrates are the most effective. Chelates and organic complexes used at equivalent elemental rates of the materials listed above are effective, but quite expensive. Oxides and most oxysulfates, except under special conditions, are not effective.

Premium fertilizers, which contain an array of micronutrients in very small quantities, may not correct a deficiency.

**Additional information can be obtained from an NCDA&CS regional agronomist or the local Cooperative Extension office.**

# North Carolina Department of Agriculture and Consumer Services

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## $ NOTE: Secondary Nutrients & Micronutrients

This note gives advice for eliminating or preventing specific soil fertility problems. The $ on your soil test report indicates actual or potential deficiencies of magnesium, copper, zinc and/or manganese. Additionally, potential toxicities are noted for copper and zinc at certain soil test levels. Recommendation codes for each of these elements are explained below.

## Magnesium (Mg) Recommendation

*0* Additional Mg is not needed.

*$* Mg levels in the soil are low.

- If lime is recommended, use dolomitic lime, which contains a minimum of 120 lb Mg per ton. Dolomitic lime is the most economical source of Mg.
- If no lime is needed, add 20–30 lb/acre of readily soluble Mg to your fertilizer. Annual applications of Mg may be required until subsequent soil tests show adequate levels in the soil.

## Copper (Cu) Recommendation

*0* Additional Cu is not needed.

*Any number other than 0*

This number is a suggested broadcast application rate for Cu, expressed in lb/acre. In this case, the Cu index (*Cu-I*) is low ($\leq 25$), and the crop will respond to Cu fertilization. Applying the suggested rate should correct the deficiency for several years. Incorporate

broadcast applications into the plow layer for maximum benefit. Foliar application is effective if the Cu deficiency occurs during the growing season, as determined by tissue testing.

*$* Monitor Cu levels in your crop. The *Cu-I* is low (≤ 25), but the indicated crop may not respond to Cu fertilization. If an application rate is given for *1st Crop*, a *$* in the *Cu* column for *2nd Crop* reminds you that the second crop may still need Cu if it was not applied to the first crop.

*C* The *Cu-I* is greater than 2000. The critical toxic level is 3000. See the narrative printed on the soil test report for further advice.

## Zinc (Zn) Recommendation

*0* Additional Zn is not needed.

*Any number other than 0*
This number is a suggested broadcast application rate for Zn, expressed in lb/acre. In this case, the Zn-availability index (*Zn-AI*) is low (≤ 25), and the crop indicated will respond to Zn. The recommended amount should correct the deficiency for several years.

*$* Monitor Zn levels in your crop. The *Zn-AI* is low (≤ 25), but the indicated crop may not respond to Zn fertilization. If an application rate is given for *1st Crop*, a *$* in the *Zn* column for *2nd Crop* reminds you that the second crop may still need Zn if it was not applied to the first crop.

*Z* The *Zn-I* is greater than 2000. The critical toxic level is 3000. See the narrative printed on the soil test report for further advice.

Peanuts are very sensitive to zinc, and toxicity may occur at soil levels well below 2000. The risk of toxicity is greater with low soil pH and has been seen at a *Zn-AI* as low as 300. A critical toxic level has been set at 500 for peanuts.

*Zn-AI* is an availability index related to soil class. *Zn-AI* will be greater than the *Zn-I* for mineral-organic (M-O) and organic (ORG) soils due to a lower target pH for these soil classes.

When Zn deficiencies occur due to high pH and phosphorus levels, a foliar application of Zn is required. The decision to apply Zn in this manner should be based on current soil tests and plant analyses. Some limestone sources contain enough Zn to build soil test levels above the critical point.

## Manganese (Mn) Recommendation

*0* Additional Mn is not needed.

*10* Apply Mn at the rate of 10 lb/acre broadcast. The Mn-availability index (*Mn-AI*) is low (≤ 25), and the indicated crop is known to respond to Mn application.

*$* Monitor your crop closely for Mn problems. In this case, the *Mn-AI* is ≤ 25, but the crop indicated may not respond to addition of Mn. Monitoring the crop through plant tissue analysis is a good way to track Mn levels in the crop. If tissue levels are low, application of foliar Mn may be warranted.

*$pH* There is an existing or potential Mn deficiency due to *pH* ≥ 6.2 and *Mn-AI* ≤ 25. The recommendations outlined here can correct or prevent this problem:

- For currently growing crops, apply a totally water-soluble source of Mn to the foliage. Depending on the severity of the deficiency and the crops's stage of growth, a second application may be required.
- Under preplant conditions and with *Mn-I* > 25, band acid-forming starter fertilizers that do not contain Mn. If *Mn-I* ≤ 25, use an acid-forming starter fertilizer containing Mn.
- If *pH* ≥ 6.2, do not soil-broadcast a Mn fertilizer. If overliming is the principal cause of Mn deficiency, apply acid-forming fertilizers or till deeply to lower the soil pH. Foliar applications and/or acid-banded treatments are remedial and may be required for each crop until the *pH* falls below 6.2.

*pH$* Mn levels are high (*Mn-AI* > 25), but there is potential for deficiency since soil pH is also high (> 6.4). Use a foliar spray of Mn fertilizer to correct a deficiency if it occurs.

Manganese deficiency is commonly observed throughout the coastal plain. It can be due to either overliming (*pH* ≥ 6.2) or inherently low levels of soil Mn. Although less frequently observed, Mn deficiencies can also occur in piedmont and mountain regions.

Mn availability is influenced by soil pH. As pH increases, Mn availability decreases. Some crops show Mn deficiency more readily than others.

On the soil test report, three values relate to Mn levels: *Mn-I*, an index correlated with the actual amount of Mn in the soil; *Mn-AI(1)*, the Mn-availability index for the first crop; and *Mn-AI(2)*, the Mn-availability index for the second crop.